

IN THE CLAIMS

Claims 2-3 and 13-17 have previously been cancelled without prejudice.

Please amend claims 1, 25, and 31.

Please enter the pending claims as follows:

1. (Currently Amended) An apparatus ~~for inducing chemical etching~~ comprising:

a holder to mount a substrate;

a stage disposed below said holder ~~to position said holder in a chamber;~~

an imaging system disposed vertically above said ~~holder and over~~ an opaque defect on said substrate;

a gas delivery system comprising a nozzle with a diameter of 100-300 microns disposed at a first angle over said ~~holder opaque defect at a tilt angle of 45-70 degrees from vertical, a distance of 50-150 microns, and an angular dispersion of 5-25 degrees~~ to dispense a reactant gas and a carrier gas from a reservoir towards said ~~opaque defect~~; and

an electron scanning delivery system disposed ~~at a second angle~~ over said ~~holder opaque defect~~ to direct electrons in a range of 0.3-3.0 keV towards said reactant gas wherein said electron beam has a tail diameter of 5-125 nanometers.

2. – 3. (Cancelled)

4. (Original) The apparatus of claim 1 wherein said substrate comprises a transmissive DUV mask.
5. (Previously Presented) The apparatus of claim 4 wherein said opaque defect comprises chrome and said reactant gas comprises chlorine and oxygen.
6. (Original) The apparatus of claim 1 wherein said substrate comprises a reflective EUV mask.
7. (Previously Presented) The apparatus of claim 6 wherein said opaque defect comprises an absorber and said reactant gas comprises Xenon Fluoride (XeF₂).
8. (Original) The apparatus of claim 1 wherein said opaque defect comprises Carbon and said reactant gas comprises water vapor or oxygen.
9. (Previously Presented) The apparatus of claim 1 further comprising a focusing system to highly focus said electrons on said opaque defect.
10. (Previously Presented) The apparatus of claim 1 further comprising a computer to control dwell time and scan rate of said electron scanning delivery system.
11. (Previously Presented) The apparatus of claim 1 further comprising an acceleration system to provide a low acceleration voltage for said electrons.

12. (Previously Presented) The apparatus of claim 1 further comprising a computer to control refresh time and retrace time of said electron scanning delivery system.

13. - 17. (Cancelled)

18. (Previously Presented) The apparatus of claim 1 wherein said gas delivery system is further to dispense a carrier gas towards said opaque defect.

19. (Previously Presented) The apparatus of claim 1 wherein said gas delivery system is to dispense said reactant gas with an angular dispersion of 5-25 degrees.

20. (Previously Presented) The apparatus of claim 1 wherein said reactant gas is to adsorb to said opaque defect and is to become disassociated.

21. (Previously Presented) The apparatus of claim 1 wherein said chamber comprises a pressure of about 0.500-10.000 milliTorr (mT) locally over said opaque defect.

22. (Previously Presented) The apparatus of claim 1 wherein said electrons form a beam comprising a current of about 0.050-1.000 nanoAmperes (nA).

23. (Previously Presented) The apparatus of claim 1 wherein said electrons form a beam comprising a tail diameter of about 5-125 nm.

24. (Previously Presented) The apparatus of claim 1 wherein said electrons comprise a range of 0.3-3.0 keV.

25. (Currently Amended) An apparatus for repairing an opaque defect on a mask without ion implantation or knock-on of atoms comprising:

 a chamber;
 a stage disposed in said chamber;
 a holder disposed over said stage;
 a mask disposed over said holder;
 an opaque defect disposed on said mask;
 an imaging system disposed directly above said opaque defect;
 a gas delivery system disposed at a first angle over said opaque defect;
 a ~~gas disposed over said opaque defect~~;
 an electron scanning delivery system disposed at a second angle over said opaque defect;
 electrons disposed over said opaque defect, wherein said electrons to induce interact with a said gas to etch said that is adsorbed and dissociated on said opaque defect without damaging underlying layers; and
 a pumping system disposed in said chamber to evacuate volatile byproducts ~~of said etch~~.

26. (Previously Presented) The apparatus of claim 25 wherein said electrons comprise a range of 0.3-3.0 keV.

27. (Previously Presented) The apparatus of claim 25 wherein said electron scanning delivery system further comprises focusing controls.

28. (Previously Presented) The apparatus of claim 25 wherein said electron scanning delivery system further comprises focusing and scanning controls that are more sophisticated than in an SEM.

29. (Previously Presented) The apparatus of claim 25 wherein said gas comprises water or oxygen.

30. (Previously Presented) The apparatus of claim 25 wherein said gas comprises Xenon Fluoride (XeF₂).

31. (Currently Amended) A mask repair system comprising:
a chamber, said chamber to hold a mask;
an imaging system disposed in said chamber to locate an opaque defect on said mask;
a gas delivery system disposed in said chamber, to dispense one or more gases from reservoirs through nozzles towards said opaque defect; and
an electron scanning delivery system disposed in said chamber to provide a highly focused beam of electrons with an electron beam size smaller than 30% of smallest critical defect to interact with said one or more gases adsorbed and dissociated over said opaque defect.

32. (Previously Presented) The apparatus of claim 31 wherein said electrons comprise an acceleration voltage of about 1.0 keV or less.

33. (Previously Presented) The apparatus of claim 31 wherein said chemical etching is reaction-limited and not mass transfer-limited.